Cost and Management

VOLUME XXVIII APRIL No. 4

Vice-President and General Manager of Eastman Kodak Company, Rochester, New York, Mr. McMaster is Deputy Chairman of the Board of Kodak Limited, London, England and a Director of Canadian Kodak Company. A graduate of Cornell University, he took post-graduate studies in Chemistry at the University of Buffalo and obtained his elementary education at Emanuel School, London, and Ayr Academy in Scotland. He joined Kodak in 1917 as a chemist and in 1939 was appointed Manager of the British factory. In 1945 he became General Manager of Kodak's European establishments and in May 1952 received his present appointment.

A graduate of the Massachusetts Institute of Technology in Mining Engineering, Mr. Hickey, who is Production Engineer for the Upjohn Company in Kalamazoo, Michigan, was connected with various mining companies in the Western United States and Old Mexico immediately after graduation. In 1945 he became Chief Engineer of the National Research Corporation. While with the corporation, he designed the vacuum dehydration plants for a number of penicillin producers, including the Upjohn Company; subsequently in October 1949, joined the Chemical Engineering Department of this firm. This paper by Mr. Hickey and the article by Mr. McMaster appear in *Cost and Management* through the courtesy of the National Association of Cost Accountants.

Mr. Brouillard is Supervisor of the Costing Department, Canadian Celanese Limited, Drummondville, Quebec. Born in Woonsocket, Rhode Island, he came to Canada in 1928 and shortly after joined the office staff of Canadian Celanese. A fine bilinguist, Mr. Brouillard obtained his C.G.A. degree in 1946 and in the same year was appointed to his present position.

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Editorial Comment . . .

Competition and the Accountant

In this free enterprise system of ours, we take for granted the constant interplay of competitive forces. It should be noted, however, that this economic contest of supply and demand is not often in complete balance. The sellers' market and the expanding economy experienced by Canada since war-end has seen the competitive force largely expended in a race to get to the consumer first with the most, and sometimes the worst. The question of bidding for the citizen's dollar with the usual trade marks of quality and cost has not been very much in evidence.

We hear now the phrases levelling off, balanced economy, recessive trends and so on. Economic adjectives are always hard to pin down but at least we do know that the post-war spending spree on consumer goods is over. To the point that a choice can now be made in most lines, supply has won the race with demand. There are some soft spots in certain industries and noticeably textiles. Many mills have closed and others are on very short time. The answer of one of the largest motor concerns recently to excessive union demands makes interesting reading. Regardless of the relationship between that particular labour body and the company, the letter is more than anything else the statement of normal competitive thinking in a tight market. We know also that Canadian international trade has suffered in the past year because, as one bank president has stated, the Canadian economy has become a high-priced one and therefore is exhibiting non-competitive characteristics.

This affects us both at home and abroad and is of growing concern to industrial Canada. As a result, most large and small companies are putting cost reduction programmes into action. These plans may be thought of in terms of anti-waste. Wasteful and elaborate production methods produce excessive costs and this results in high prices. Continuous high prices tend to produce buyer resistance and the result is a limiting of demand. Thus the economics of supply and demand shift in reverse to the situation current in the last few years.

A typical cost reduction or anti-waste plan will show a list of ideas, for changes in product design, for the use of automatic machinery, for new methods, for changes in factory layout and for better material handling. How often does such a programme mention review of staff, or suggest a critical survey of office and supervisory help?

Is it not possible that we are still using the standards of a generation ago, in this matter? It takes so many payroll clerks per 100 of hourly rated employees. So many billings or so many requisitions per day may be made or posted per clerk. It seems that these same output figures have been used too long.

How many clerks really have full-time jobs? Recently, an Ontario firm that had always prided itself on its office and accounting efficiency,

brought in methods engineers to study and evaluate the office load. The shocking results showed that most of the staff were about 60% efficient or had a 60% work load.

In 1900, one office clerk took care of 30 employees. In 1954 the ratio is one to three. It is admitted that more detailed records are necessary to-day but we have automatic machinery and a far better understanding of work flow and administrative principles at our disposal.

The situation becomes worse as you go further in the hierarchy of the office. Outside of a few noteworthy exceptions, how many offices are well administered? How many supervisors really know how to organize their time? It is obviously difficult to measure the efficiency and worth of administrative heads. The problems of human relations and communication inject the intangible to such a degree that we are unable to assess work effort in terms of mathematics. We have, however, some indicators in the currency of reports and statements. We also can judge worth, by the completeness and clearness of analytical material presented. Even the state of English usage is a guide, since good grammar and diction are merely a means to rapid and clear communication. All of these means of measurement give a rather sad picture of the efficiency of the office on the administrative side.

This is a ready-made challenge for the accountant. The composite picture of the inefficient office adds to the high cost economy in Canada. Let us bring into the office the engineering methods that have worked so well in the plant. Investigate the uses of mechanical ways of doing traditional hand-written and calculative clerical work. Use job analysis and classification in order to achieve a correct level of establishment. A large assignment exists in organizing and planning the work of the supervisory staff.

In this sharpening of the competitive forces, it will be necessary for the accountant and office manager to play his part in cost reduction. By an organized effort in the office he can raise the quality of work and, at the same time, reduce costs.

PERSONALS

Camille Blier, a student member of the Quebec City Chapter, was recently admitted to membership in the Institute of Chartered Accountants of Quebec, after passing the final examinations of the Institute.

J. Austin Parker, R.I.A., a member of the Society of Industrial and Cost Accountants of Nova Scotia, and Secretary-Treasurer of the Mersey Paper Company Limited, in Liverpool, Nova Scotia, has been elected a director of the Company.

W. E. Williams, R.I.A., has joined Brown Boggs Foundry and Machine Company Limited, in Hamilton, as Chief Accountant, and upon completion of the firm's new plant, will assume the position of Office Manager. A member of the Niagara Peninsula Chapter before transferring to Hamilton, Mr. Williams was with McIntyre Aluminum Products Limited, in Niagara Falls.

C & M Round-Up . . .

By N. R. Barfoot, R.I.A.

Labour

Here are a few current statistics on labour organization in Canada: Total number of union locals is 6,235 with a membership of 1,146,121. A breakdown of these shows:

Type of Union	*No. Branches*	*Membership*
Internationals	3,868	850,545
National and Regional	1,723	282,534
Directly chartered unions	598	78,737
Unaffiliated local unions	46	7,898

A distribution by industrial groups indicates the following:

Manufacturing	43.3%
Transportation and communication	23.3%
Service	11.3%
Construction	9.6%
Mining	4.9%
Logging	2.9%
Trade	2.1%
All others	2.6%

It might be interesting to note that the transportation industry is more than two-thirds organized. Manufacturing, mining, construction and logging are one-third to two-thirds organized. Trade, finance and public utilities are less than one-third organized.

The greatest concentration of membership, as may be expected, is in the metropolitan centres. The Montreal and Toronto areas contain almost one-quarter of the union members. Most cities with populations of 20,000 or more have over 2,500 union members.

Trans-Canada Highway

This has been talked of for many years. Here is the present state of things:

Total mileage from coast to coast	4,497
Mileage completed to date	814
Mileage graded	1,195
Total cost to date	80.5 millions

Money and Credit Control

Proposed legislation would empower the Bank of Canada to fix the cash ratio for the chartered banks.

Hitherto each bank has been accustomed to fix its own proportion of cash to deposits. There is a 5% minimum required and although in total the cash reserves of all banks are maintained at a 10% of deposit liabilities, individual banks vary a good deal.

By fixing the cash ratio, the Central Bank would be able to restrict or expand the amount of cash available for loans. During inflationary

periods by raising the cash ratio the amount available for loans would be less. When inflationary dangers were over the cash ratio could be dropped making it possible for the bank to increase their lending operations.

The new legislation will produce a uniform pattern to controlling credit in Canada as used by the chartered banks. It will also give a quick signal to business in general that credit should be restricted.

Federal Budget 1954

Here is the proposed '54-'55 national budget of income and expenditures in millions of dollars:

Income	
Personal Income Tax	1,275
Corporation Income Tax	1,200
Customs Import Duties	425
Excise Duties	240
Sales Tax	605
Other Excise Taxes	310
Other Taxes	108
Post Office	127
Other	215
Total Budgetary Revenue	4,505
Old Age Security Taxes collected via personal and corporation tax	297
Expenditure	
Defence	1,954
Interest on Public Debt	492
Payments to Provinces	351
Health and Welfare and Veterans' Affairs	683
Post Office	128
Other	884
Total Budgetary Expenditure	4,525
Old Age Security Payments	356

British Money in Canada

The increasing amount of U.K. capital invested in this country in the last five years is of more than passing interest to Canadians. As we are all aware, in the early Canadian colonial days, Great Britain poured money into the development of this land. Since the first World War and up to 1948, the money interest of the United Kingdom drifted down to a new low point. Here are the up-to-date figures on British money in Canada:

Number of post-war U.K. plants	81
Number of employees	24,284

In order of importance the types of plants are transportation equipment, electrical apparatus, iron and steel products, food, beverage, tobacco and chemical.

U.K. direct investment since 1946 has been over 235 millions with over 60 million in 1953.

Not generally known is an interest by British firms in real estate companies, retailing and investment firms.

Reasons for investment here are the expanding Canadian economy — a favourable investment climate due to stable government, a better interest return than Europe and a traditional interest in Canadian affairs.

Public Works '54

151 millions will be appropriated for all purposes.

The engineering branch, covering harbour and river works, dredging, bridges and docks will be voted 26 millions.

The architectural branch will spend 49 millions on new public buildings and 36.5 millions on repair and maintenance.

Nearly 11 millions will be spent in Quebec and 10 millions in Ottawa on new structures.

The Trans-Canada Highway will be given 22 millions, about the same as spent last year.

Housing

Did you know that:

700,000 houses have been built since the war.

One in five Canadians lives in a post-war house or apartment.

1953 was the country's biggest building year with 102,409 housing starts.

Over 1 billion or one-fifth of the country's total investment was in housing.

Over half of all houses are financed by mortgages from lending institutions. This does not include private mortgages.

Subway

Canada's first subway opened March 30 of this year in Toronto. Here are a few interesting statistics:

Begun September 8, 1949.

Total cost, 50 millions.

Total length, 4.6 miles.

Number of cars, 104; speed, 18-20 miles per hour.

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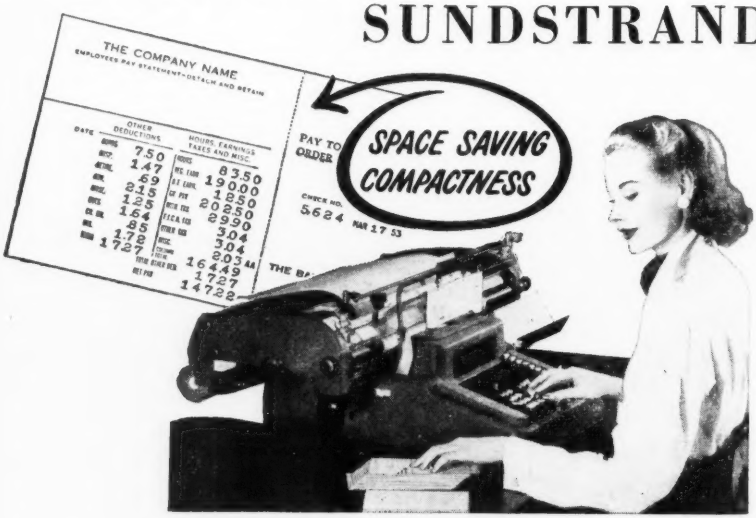

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Books in Review . . .

RATE OF RETURN ON CAPITAL EXPENDITURES

By Horace G. Hill, Jr., Budget Director, Atlantic Refining Company, Report of the Research Committee, Philadelphia Chapter, National Society for Business Budgeting, August 1953, pp. 23.

This report, bearing the full title, *A New Method of Computing Rate of Return on Capital Expenditures* has been prepared in a forthright manner and gives complete details on how the final recommendations are developed. In spite of all the required reading there is to-day, a careful review of the booklet should be a "must" for all those whose function requires them to recommend or determine the need for, and financing of capital expenditure.

The Committee found some six methods in current use for computing the rate of return:

1. The Payout Period — was often referred to as the measure of Profitability of a capital investment. It has many forms depending on the definitions of "initial investment" and "revenue" through which it is paid back.
2. The First Year Profit — in relation to the initial investment was occasionally used.
3. The MAPI (or Terborgh) formula was in use in some plants as a guide to a capital expenditure programme.
4. The Average Book Method.
5. The Investor's Method.
6. In a surprising number of companies, no system was in use except those in which expenditure depended entirely on the judgment of the executives.

Faced with the usual type of objections by those who had no current interest in a systematic approach, the committee agreed upon the following assumptions:

(a) The long range look should be the only basis for an approval decision.
(b) The basic excuse for appropriating funds is to make a profit.
(c) There is always an alternative to every request.
(d) The Committee hopes that its study will provide a method of computing a rate of return — such method to be realistic and dependable.

Having thus established the objective, the Committee concentrated on a critical study of the two methods in current practice that appeared most logical — the Average Book Method, and the Investors Method.

Test problems concerning five variations of a basic report re capital expenditure as to (a) policy of capitalization, (b) policy of amortization, (c) patterns of cash receipts, (d) salvage value, (e) pre-operating investment were developed for each of the two methods defined as:

The Average Book Method: relates the average profit to the averaged net fixed asset remaining on the Books, both averages

being taken over the span of active operation of the project.
The Investors Method: indicates the maximum rate of interest at which funds could be borrowed to finance the project without causing it to show an ultimate loss.

The results of this complete testing of two formulae showed the Investors Method to be completely sound and "The Philadelphia Chapter adopted the report of its Committee . . . and is offering the Investors Method for computing the rate of return on a proposed outlay of funds . . . to industry."

Some considerable thought was given to the idea of re-printing the complete work through *Cost and Management*, but was laid aside in favour of a brief summary review because of the following:

(a) The work as presented would be useful only to those companies sufficiently forward-looking to spend time in a complete appraisal of the results compared to their own current method.

(b) To stimulate perhaps a "few letters to the Editor" which might be (1) in defence of Item 6 foregoing, or (2) in decrying (or otherwise) *Cost and Management* policy in the review of items of this nature.

(c) To gauge reader interest by saying that a copy will be obtained for you upon receipt of your request.

VICTOR F. DAVIES, R.I.A.

MANUFACTURING MANAGEMENT

By Franklin G. Moore, Ph.D., published by Richard D. Irwin, Inc., Homewood, Illinois, pp. 832.

Over a period of years a considerable number of textbooks relating to Industrial Management have been read and studied. Dr. Moore's fine contribution to this fund of literature is now available and is well worth the time spent in its reading.

The author has presented an impressive list of chapter topics. It is extremely difficult to find any subject that has not been discussed pro and con. This is what makes *Manufacturing Management* outstanding. There are no theoretical academic solutions but actual case discussions, usually two sides, as to how big industry manages its affairs. The author also clearly ties in the tax picture with each phase of management.

The liberal use of descriptive photographs of machines and assemblies is excellent for the present but presents the possibility that in the future some parts of the text could become outdated. This is true of most textbooks written and does not subtract from its value as a study and reference book.

GEORGE W. BAIRD, R.I.A.

Current Articles of Interest . . .

A compilation of current articles, available to members, on loan from the Library of the Society.

ACCOUNTING

THE ACCOUNTING IMPLICATIONS OF CHANGING MONEY VALUES — The Society's Observations — The Accountants' Journal — Feb. '54.

ACCOUNTING IN RELATION TO CHANGES IN THE PURCHASING POWER OF MONEY — The Accountants' Journal — Feb. '54.

ACCOUNTING PROBLEMS OF SMALL BUSINESS, by B. W. Brannon — Irish Accountant and Secretary — Feb. '54.

THE FORMAL PRINCIPLES OF PUBLIC COMPANY ACCOUNTING, by F. S. Bray — The Canadian Chartered Accountant — Mar. '54.

ACCOUNTS

THE EVOLUTION OF MANAGEMENT ACCOUNTS, by C. A. Wilkes — The Cost Accountant — Feb. '54.

THE ORGANIZATION OF ACCOUNTS, by A. H. Taylor — The Cost Accountant — Feb. '54.

ACCOUNTS RECEIVABLE

STATISTICAL SAMPLING APPLIED TO AGING OF ACCOUNTS RECEIVABLE, by R. M. Trueblood and R. M. Cyert — The Journal of Accountancy — Mar. '54.

AUTOMOBILES

INSTALLING A BONUS INCENTIVE SCHEME IN A SOUTH AFRICAN MOTOR WORKSHOP, by F. G. Beard — The Cost Accountant — Mar. '54.

BUDGETS AND BUDGETING

BUDGETARY CONTROL FOR MEDIUM-SIZE BUSINESS, by C. S. Rockey — American Institute of Accountants — 66th Annual Meeting.

DEVELOPMENT AND USE OF THE BUDGET, by J. B. Heckert — American Institute of Accountants — 66th Annual Meeting.

PLANNING AND CONTROL THROUGH BUDGETING, by F. L. Esposito — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

STEPS BEFORE ACTUAL BUDGET PREPARATION, by A. H. Smith — American Institute of Accountants — 66th Annual Meeting.

COMMUNICATION

THE INTERNAL AUDITOR'S RESPONSIBILITY FOR COMMUNICATIONS, by E. B. Giblin — The Internal Auditor — Mar. '54.

TOP MANAGEMENT RESPONSIBILITY FOR COMMUNICATIONS, by J. J. Butler — The Internal Auditor — Mar. '54.

CONTROLLER

IMPROVING CONTROLLERSHIP THROUGH PROBABILITY STATISTICS, by H. M. Daniels — The Controller — Mar. '54.

MAKING CONTROLLERS ARTICULATE, by G. E. Mills — The Controller — Mar. '54.

COST CONTROL

THE CONTROL OF SERVICE DEPARTMENT COSTS, by F. C. de Paula — The Cost Accountant — Feb. '54.

COST DATA

COST DATA BY INTERCOM, by F. D. Shaw — Factory Management and Maintenance — Mar. '54.

COST REDUCTION

COST REDUCTION TO HELP SMALL BUSINESS, by W. B. Edgar — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

COST AND MANAGEMENT

DIRECT COSTING

ALTERNATIVES TO DIRECT COSTING, by H. C. Greer — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

CONVERTIBILITY OF DIRECT AND CONVENTIONAL COSTING, by J. A. Mauriello — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

DIRECT COSTING AND ITS IMPLICATION IN FINANCIAL REPORTING, by R. Wellington — American Institute of Accountants — 66th Annual Meeting.

DIRECT COSTING AS A MULTIPLE-PURPOSE MANAGEMENT TOOL, by C. R. Fay — American Institute of Accountants — 66th Annual Meeting.

INACCURACIES IN DIRECT COSTING, by J. W. Ludwig — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

ELECTRONICS

IS PUSH-BUTTON ACCOUNTING AROUND THE CORNER? by J. Gibbons — The Internal Auditor — Mar. '54.

EXECUTIVE COMPENSATION

PAY PLAN FOR MANAGEMENT, by R. O. Ferguson, L. F. Sargent, N. V. Reinfeld — Factory Management and Maintenance — Mar. '54.

FINANCIAL STATEMENTS

INTERPRETATION OF PUBLIISHED ACCOUNTS, by G. F. Brown — The Cost Accountant — Mar. '54.

INCENTIVES

INSTALLING A BONUS INCENTIVE SCHEME IN A SOUTH AFRICAN MOTOR WORKSHOP, by F. G. Beard — The Cost Accountant — Mar. '54.

INSTITUTIONAL ACCOUNTING

AUTHORITATIVE ACCOUNTING GUIDE FOR NON-PROFIT INSTITUTIONS, by R. S. Johns — The Journal of Accountancy — Mar. '54.

INVENTORIES

BASE STOCK VALUATION — Irish Accountant and Secretary — Feb. '54.

INTERNAL CONTROL OVER INVENTORIES IN MANUFACTURING CONCERNS, by H. C. McGuigan — The Journal of Accountancy — Mar. '54.

LABOUR

COMPANY LABOUR POLICY — AND THE ACCOUNTANT'S PART, by L. C. Shaw — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

COSTING OF BENEFITS FOR WAGE NEGOTIATIONS, by J. G. Wayman — N.A.C.A. Bulletin — Mar. '54 — Sec. 1.

MANAGEMENT

HELPING TOP MANAGEMENT KEEP ON TOP OF RESEARCH, by J. V. James — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

PAY PLAN FOR MANAGEMENT, by R. O. Ferguson, L. F. Sargent, N. V. Reinfeld — Factory Management and Maintenance — Mar. '54.

PRODUCTIVITY: AN IMPORTANT FUNCTION IN MANAGEMENT, by J. W. Roberts — The Controller — Mar. '54.

MANAGEMENT ACCOUNTING

MANAGEMENT ACCOUNTING: SALES PLANNING AND THE ASSESSMENT OF MARKETING ACHIEVEMENT, by H. Dugdale — The Accountants' Journal — Feb. '54.

THE PECULIAR POSITION OF THE MANAGEMENT ACCOUNTANT, by A. W. Field — The Cost Accountant — Mar. '54.

CURRENT ARTICLES OF INTEREST

MOTION PICTURES

COMMERCIAL MOTION PICTURE PRODUCTION ACCOUNTING, by Ben Dyer — The N.Y. Certified Public Accountant — Mar. '54.

ORGANIZATION

THERE'S NO MAGIC IN EXECUTIVE ABILITY, by A. V. Madge — Business Management — Feb. '54.

PENNY ELIMINATION

CENTSLESS ACCOUNTING AT LEVER BROTHERS LTD., by F. W. Peart — Business Management — Feb. '54.

QUALITY CONTROL

NINE STEPS TO BETTER QUALITY, by J. M. Juran — Factory Management and Maintenance — Mar. '54.

SALES ANALYSIS

A CASE IN SYSTEMATIC SALES FORECASTING, by C. E. Manteuffel — N.A.C.A. Bulletin — Mar. '54, Sec. 1.

STATISTICS

AUDITING USES OF STATISTICS — SOME EXPERIMENTAL APPLICATIONS, by R. W. Johnson — The Internal Auditor — Mar. '54.

AUDITING USES OF STATISTICS — UNDERLYING STATISTICAL CONCEPTS, by B. M. Rowles — The Internal Auditor — Mar. '54.

IMPROVING CONTROLLERSHIP THROUGH PROBABILITY STATISTICS, by H. M. Daniels — The Controller — Mar. '54.

SYSTEMS

DEMOCRACY IN METHODS WORK, by R. G. Sinn — Business Management — Feb. '54.

TRUST ACCOUNTANCY

COMMON TRUST FUNDS, by J. Wallace — The Controller — Mar. '54.

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OBITUARY

R. A. McLean, R.I.A.

It is with much regret that we announce the death of R. A. McLean, R.I.A., on February 28th. A Past Chairman of the Toronto Chapter, and Office Manager and Chief Accountant of Pilkington Glass Manufacturing Limited since 1950, Mr. McLean's death, caused by coronary thrombosis, came as a great shock to his business associates and his many friends in the Society.

To Mrs. McLean, we extend our deepest sympathy.

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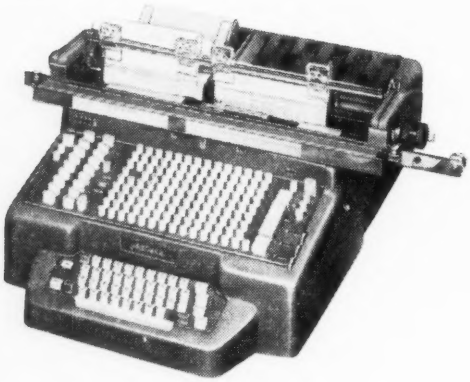

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Management Planning and the Accountant To-Day . . .

By DONALD MCMASTER,
Vice-President and General Manager,
Eastman Kodak Company,
Rochester, N.Y.

In this article, the author provides some specific suggestions for correlating the accounting and management functions in planning. It is his belief that the accountant's function is to evaluate the effect of alternative plans upon future earning capacity. Specific problems in management planning are considered to show that there are various cost concepts which may or may not be relevant, and in the final analysis it is the accountant's responsibility to choose the concept to be used.

IT IS not the intention of this paper to laboriously enumerate all of the responsibilities which are entrusted to accountants as members of the management team. It is, however, intended to act as an examination of a much more limited area and a presentation of some ideas which are essential if accountants are to attain optimum effectiveness in their relationships with other members of management. In the language of the photographer, a narrow angle lens is going to be substituted for a wide angle lens and the camera is going to be focussed very sharply at close range rather than at infinity.

In order to establish the perimeter for the picture it may be helpful to scan the field and eliminate those areas upon which the camera will not be focussed. To do this, it is necessary to agree on the answers to two questions. In their most concise form these questions can be expressed as follows: What do accountants do? And, what does management do?

The Function of the Accountant

In reviewing the literature on accounting and management, it was somewhat of a surprise to find that accountants don't know, or at least don't agree on, what accountants do, and that they love to argue orally and in print about the matter. In this literature, there were penetrating analyses of the accounting functions, one of which is contained in a book entitled *Practical Controllership*, by David R. Anderson.

Mr. Anderson suggests that the objectives of accountants, broadly speaking, are to:

1. Control and protect the assets of the business.
2. Comply with the legal reporting and record-keeping requirements.
3. Assist management in controlling operations and formulating policies.

This definition is helpful. Points one and two can be immediately eliminated from the discussion. Control and protection of assets and compliance with legal requirements are vital responsibilities of accountants and are vital functions of management. However, they are outside

the picture upon which the camera will be focussed. The third objective, direct assistance to management, is the general area for review.

The Function of Management

The answer to the other question — What does management do? — will narrow the issue even further. Management in the broad sense includes all of the various strata from the Chairman of the Board, and/or the President, to the front line supervision, and in between all of the various levels of line supervision and their technical staffs. Each of these management groups requires assistance from accountants. Each management group has informational needs which are peculiar to the sphere of operations for which it is responsible. This paper will concentrate on the top management group. The top management group is the farthest from the scene of combat and for this reason is almost entirely dependent for its informational needs upon others in the organization. Henceforth, the term management will be used with the understanding that it refers primarily to top-management. The relationships between accountants and top management are not fundamentally different from those which exist between accountants and other management groups.

What does management do? It is not necessary to attempt to frame an all-inclusive definition nor even to arrive at complete agreement on what such a definition would include. The function of management in industry is to weigh up and to balance the various factors which influence the enterprise as to insure success. The job of a manager in a competitive economy is to dispose men and materials in such a way as to produce something which is wanted by the consumer. The product must be of high quality. It must be manufactured in sufficient quantity and at a cost which will justify a selling price satisfactory to the customer and to the producer. To accomplish this, management must plan ahead and chart the route it is to follow. It must have reliable and up-to-date information as to where it has been, and most important of all, where it is going.

The planning aspect, or charting the future course of the business is one of the major activities of management. As a matter of fact, management cannot avoid planning for the future. Such an elementary activity as placing an order for the delivery of some raw material next week or next month involves some sort of planning. When an employee is advised to report to work to-morrow, some planning has been done. When a contractor is engaged to construct a new building, planning at the top-management level is involved. The point here is that planning along with the control which that term implies is of necessity a vital managerial activity.

Now, perhaps, the picture is more clearly in focus. Earlier it was stated that accountants assisted management and now it is evident that management is engaged very substantially in planning the future course

of the business and in the administration of the present leading to the future. If accountants are to be truly effective members of management they must gear their activities to this planning function.

This is a glib and obvious observation and does not present a new concept. Yet it is such an important aspect of the accountant's job that it is worth re-examining and reconsidering.

The Accountant's Part in Management Planning

What does planning involve and what is expected of accountants in this regard? Planning involves choices between alternatives. In choosing between alternatives it is necessary for someone to estimate the effect of each separate plan upon future expenses and income. The accountant, and in particular, the cost accountant, is primarily responsible for estimating the effect upon expenses, i.e., the costs. Cost and profit reports to general management act as guides to the running of the business. They assist management to assess the merits of proposals which are likely to affect profits. They supply information which will help management to initiate new ideas and projects and to eliminate wasteful practices. They offer to management means of controlling all phases of the business from the purchase of the raw materials to the turning of these raw materials into manufactured articles. They indicate the proper control of stocking, of the sale and distribution of the products of the business; and they help to relate the various staff departments of the company.

In attempting to evaluate the various plans, it was stated that it is necessary to estimate the effect of each alternative upon future expenses and income. In addition to the accountant it may be, in fact it is likely, that the experts in market research, the statistician, the engineer, and other members of the staff will all make a contribution. For this discussion it will be assumed that these other members of the management team are performing as perfect aides, so that the accountant has available to him the expert assistance he may require.

To repeat, the accountant's function in planning is to evaluate the effect of alternative plans upon future expenses. It is the rare occasion when "actual full costs" reported by conventional accounting methods are, per se, relevant costs for planning the future. Orthodox financial accounts produce costs which are admirably suited to the financial and legal purposes for which they were intended. But for managerial planning the relevant cost concept will ordinarily be something entirely different.

The Place of Cost Concepts in Planning

It will be helpful to consider a few examples of cost concepts other than "actual full costs" and illustrate how these concepts have a place in business planning. There are many such concepts, too many to examine each in detail. In general, it is easier to think of these in pairs. For

example there are short-run vs. long-run costs, variable vs. fixed costs, out-of-pocket vs. book costs, replacement vs. historical costs, and finally — and this is the contrast which cannot be emphasized too strongly — past vs. future costs. It must be recognized, however, that these various concepts are not independent one from the other. There are past costs which were variable, there are future costs which will be variable; there are past costs which were fixed and future costs which will be fixed.

Since all of the concepts in this list, which does not purport to be exhaustive, cannot be covered thoroughly, it would be well to concentrate on a few examples.

Suppose the management wants to determine whether or not to expand into a new market area and whether such expansion will require additional production facilities. Quite obviously, they must deal with future costs, not past costs. And as far as the additional assets are concerned it is replacement cost not historical cost which is appropriate to this situation. If, as is quite often the case, the management is short of cash, they must give consideration to the out-of-pocket costs involved. It is apparent, therefore, that the nature of managerial problems is such that in considering these problems it is necessary to employ a variety of cost concepts. No single cost concept will always provide the correct approach.

This problem of cost concepts has been discussed in a rather abstract sort of way. To emphasize the suggestion that future costs represent the only costs that matter for most executive decisions, it would be appropriate to examine some of the major managerial uses in which cost information is utilized. Among these the following would be included:

1. Projection of future earnings statements.
2. Appraisal of capital programmes.
3. Decisions with respect to new products.
4. Pricing.
5. Cash budgeting.

These are the most important uses to which management can put cost information. In each instance the relevant cost is future cost, not past cost.

The future is always uncertain but this does not relieve the necessity of attempting to forecast costs. If past costs are used when considering the managerial problems listed previously the assumption is made that unvarnished cost history is the best estimate that can be conjured up for the future. It is the rare instance, indeed, when historical cost represents the best estimate which can be made of the future. It is only one of the guides.

This discussion of future costs as against past costs can be summed up in the statement that management decisions are obviously directed toward the future; hence they require comparative estimates concerning future situations. To the extent that cost information of any kind can

assist management in evaluating these situations, future costs are the only costs which matter.

At this stage, one point, mentioned earlier, should be re-emphasized. There are a variety of cost concepts and for each managerial problem there are certain concepts which are relevant and others which are irrelevant. Quite naturally the question arises — who is to choose the appropriate concept to be used in considering specific managerial problems? This is the responsibility which accountants must accept. Other members of management should expect that accountants will acquire sufficient understanding of the problems of the business to serve up financial data for managerial purposes which will be based on costs appropriate to the problem under consideration.

In order to accomplish these objectives it must be quite clear that accountants should, as a prerequisite, acquire an understanding of all phases of business management. This requires, among other things, an exchange of information between accountants and other members of management. This is the essence of teamwork. To attain maximum effectiveness, accountants must do their part to establish and maintain free flowing lines of communication between themselves and other members of the management team.

Reports to Management

Another area in the field of relationship between accountants and management now comes into the picture which should be brought into sharp focus. Specifically, this is the matter of accounting reports to management. This is one of the means, no doubt the most important means, by which accountants communicate with other members of management. If an attempt was made to choose a single criterion by which the effectiveness of accounting effort is judged, it would certainly turn out to be the quality of the reports furnished to management. The primary criterion for measuring the performance of the production man is quite simply this, did he meet the production schedule; for the salesman, did he generate the sales; and for the accountant, did he produce provocative, lively and effective reports? And were they clearly and concisely expressed? No doubt, this problem has been considered more than once over the years. Because of its importance, however, it merits re-emphasis.

The prime requisite of any report is that the information which it is intended to convey can be clearly understood by the recipient.

Accountants have many different types of recipients for their reports and quite clearly each type has different informational needs and varying backgrounds. Accountants must prepare reports for employees, for creditors, for the owners, for governmental agencies, even for the general public, as well as for management. This discussion, however, should be limited to reports to management, primarily the top management group,

therefore, a brief consideration will be given to the problems of providing understandable accounting reports to this top-management group.

For example, consider the president who does not have a financial background. It is likely that he has sales, production, engineering and technical training. An examination of his mail would reveal that it contains an amazing conglomeration of reports originating with a variety of experts of one sort or another. Each of these groups of experts speaks a language which is different from that spoken by other groups of experts. These different languages are in reality forms of shorthand which are most useful and worthwhile tools and permit people trained in a particular field to convey ideas efficiently to others who have had the benefit of similar training. But usually this form of shorthand has no more place in a report to management than does the form of shorthand used by the stenographer. The president in this example also represents others in the general management who must face up to this same sort of language trouble in greater or lesser degree.

There are two obvious solutions to this situation. Either the president must learn a whole variety of languages; or the experts, and in this case, the accountants, must learn to express their messages in the language of the layman. In a very practical sense, of course, it is not such an either-or situation as suggested. The general officers will acquire an understanding of some of the technical terms in use, but as a general rule, the following guiding principle would be appropriate. Do not over-estimate the ability of management to understand ideas which are expressed in one particular jargon. Conversely, do not under-estimate the ability of management to grasp complex ideas which are expressed in lay language. There is no formula which will enable the accountant to attain this goal automatically. However, by properly mixing two ingredients, ingenuity and hard work, the accountant can approach a level of readability which will enhance the value of his reports many times over.

It is of importance to management to have, wherever possible without undue prolixity, some comparison with past performances, with standards, with budgets, and with estimates. It is impossible for even the most accomplished manager to retain in his mind all of the data necessary to make his own comparisons, and it should be one of the functions of the writer of a report to select the data which in his opinion will serve best to throw the story into relief. At times one of these comparisons — past performances, standards, or budgets — will be preferred to another, and this will vary, of course, with the nature of the report. Some indication of perspective, of the relationship of the various phases of the report to the company activities as a whole should be given whenever possible. Very often it is difficult for the manager to assess the value of a particular report against the mass of other

information which is flowing in to him, and some exposition on the importance of the report should be presented.

Thus far, consideration has been given to the use of words in accounting reports. It has been simply assumed that there will be words, but too often this is not the case. Rather, the executive is served up a mass of figures without accompanying explanations, and in effect is dared to see if he can make any sensible deductions from this mass of figures. More times than not he does not have time to accept the challenge, and must pass on in despair hoping against hope that there is nothing concealed in the mass of figures which requires action on his part. How many accountants have "griped" because management failed to act on the basis of data they provided? Could this be the reason?

Graphic presentation has been called the shorthand of statistics. The real virtue of graphic presentation, however, is that it is an aid to memory. Many management decisions, of a day-to-day nature, involve the use of accounting data in an indirect manner. There are, for instance, the problems in which the money involved is just one of many considerations. It would not be wise for an executive to take the time to seek access to specific accounting information pertaining to each such problem with which he must deal. He must depend upon his memory. Information learned from a chart is infinitely easier to remember and draw upon when needed than is information which has been presented as an array of figures.

Graphic presentation is not an art which is mastered in one easy lesson. It is quite easy, but sometimes futile, merely to toss in a chart or two for window dressing in the reports. This is certainly not the correct approach. Rather, the accountant should master the basic principles of graphic presentation and learn to select the technique most appropriate for the information under consideration. In doing this, he will have added a most valuable tool to his kit, and one which will increase the effectiveness of his reports to a degree which he may well find surprising.

There is another rather obvious means by which the accountant can improve the understandability of his reports, one which is gaining recognition rapidly. This is the use of photographs as an integral part of the reports. It has been quite common for a number of years to use pictures to help get the financial story over to employees, to stockholders, and to the general public. Quite naturally the success attained in this field has led to the adoption of similar techniques for getting the financial story over to management, particularly with respect to special cost studies.

The advantages to be realized through the use of photographs are similar to those suggested previously in connection with graphic presentation. Pictures, judiciously employed in reports, will enable management to grasp facts and ideas more rapidly and, equally important, to retain them longer.

The possibilities for the use of pictures in reports is probably limited only by ingenuity. Possibly the most fertile area for the use of pictures in business reports is in capital budgeting and in reporting expenditures in relation to the budget. Several years ago our company was faced with the problem of finding more storage space in an already over-crowded plant. A survey of the situation was instigated and subsequently a report submitted to management outlining the problem and the proposed solution. The report contained the required array of figures and in addition a few pictures depicting the existing cramped storage and shipping areas. Approval to spend several millions of dollars to construct adequate facilities was forthcoming very shortly after the report was received by management. In this particular instance the pictures were worth more than the proverbial 10,000 words per picture. All of the figures and descriptive material available could not have dramatized the need for new facilities as did the photographs accompanying this particular report. This is just one example of the importance of photography as an ally in the search for improved methods of reporting financial facts to management.

The accountant, for the most part, has an advisory function, despite his strong share in management. He must work through authorized management; therefore, the content and quality of his reports will largely determine the extent to which he can bring his unique knowledge and skill to bear on the operation of the business. To this end, the accountant should bear in mind the following rules:

1. Reports should be couched in plain, simple language; as free as possible from too technical nomenclature.
2. They should contain an interpretation by the author of the report of complicated situations and involved relationships, rather than purely factual.
3. They should be leavened and lightened by the judicious use of graphs, charts, and, where applicable, pictures.
4. They should be forward looking.
5. They should include an adequate summary, containing the essence of the report.

Conclusion

This paper has been designed to bring into focus only a limited area in the total picture of the relationship between management and the accountant to-day. In so doing, the emphasis on certain pieces may distort the whole. These ideas should be placed in the proper perspective with regard to the total accounting function. It is imperative, however, that the accountant enhance his understanding of management problems, gear his accounting efforts to these problems, and prepare reports which will be understandable to management. If he does so, he will find that he is on the team, and in the game. Fortunately, too, this is the type of game in which everyone wins.

The Accountant Teams Up With the Engineer . . .

By H. A. Hickey,
Production Engineer, The Upjohn Company, Kalamazoo, Michigan

By co-operative planning, the accountant and the engineer can develop a basic accounting structure which will provide each with the necessary figures to carry out his function in costing the installation of equipment. The author discusses two methods of accounting for installation costs — the Individual-Work-Order Plan, and the Area-Work-Order Plan, and relates a case history which demonstrates an effective accounting procedure for the installation of new and used equipment.

THE engineer can often render valuable service to the cost accountant in establishing a basis for distribution of equipment installation costs. This problem becomes unusually troublesome when the equipment consists of a large number of small units which are used in a highly diversified manufacturing operation. A further complication is encountered when some of the machines are used machines which are being removed from their original location to be installed alongside new machines which are being installed for the first time.

The used machines were capitalized both as to purchase price and installation cost at the time they were first placed in operation. The capitalization of either the full amount of the second installation cost, or of a portion of this cost equivalent to the unamortized life of the machine, would cause a sudden increase in the book value of the machine which could not be accounted for physically by the machine's condition, type or style. All costs incurred in the processes of removing the old machine from its original location and of transportation to and installation in its new location should be charged to direct expense at the time such work is done. This procedure permits continued amortization of the machine in its new location at its original amortization rate and avoids creation of fictitious book values in the capital accounts.

The Jobs of the Engineer and the Accountant

The planning which must necessarily precede any large scale equipment installation job is usually considered to be entirely the engineer's responsibility. The engineer plans in terms of deadlines, physical difficulties, availability of labour, factory production rates during the transition period, local stocks of installation materials, and a host of other factors too numerous to mention. When the machines are all installed and operating in production, the engineer considers his job to be completed. To the engineer the proof of completion is the machine in place and operating. The accountant, however, has a considerable stake in the engineer's plans, since the accountant takes over when the engineer finishes. The only firm figure the accountant can find in a mass of item costs, area costs, sub-totals and totals is the

overall cost of the entire job, and it is the accountant who is asked by management to distribute this total cost for capitalization purposes. It is small wonder that cost accountants become prematurely gray!

Recognition by the engineer of the accountant's needs will not increase the complexity of the engineer's job, nor will it change the engineer's plans. Co-operation between the engineer and the accountant during the planning stage will evolve a basic accounting structure which will be of material assistance in simplifying cost distribution when the physical job is completed. Techniques and methods of record-keeping only are involved, but the selection of these techniques should be agreed upon by both the engineer and the accountant prior to starting the job.

The Basic Accounting Structure

Two general procedures are available in setting up the basic accounting structure. These general procedures, or methods, are:

1. The assignment of individual work-orders to each individual machine which is to be installed.
2. The assignment of work-orders to building areas, each area-work-order to cover all machines installed in the designated area.

If the first, or individual-work-order, method is to be followed, all orders assigned to reinstallation of used machines should be so designated to distinguish these costs from the costs accumulated for installation of new machines. The costs accumulated in reinstallation of used machines can be easily totalled and expensed at definite intervals, usually by months, during the course of the work. It is not necessary to wait until the entire job is completed to charge these direct expense items since the used machine is being currently amortized at the rate set up at the time of its purchase and original installation.

The costs accumulated under individual-work-orders assigned to individual new machines constitute directly the installation cost of that machine, and can be directly capitalized as "installed cost" by adding the purchase price of the new machine f.o.b. the jobsite, plus the proper percentage for job overhead and contractors' fees.

If the second, or area-work-order, method is to be used, two area-work-orders should be issued for each area. One of these orders is assigned to the installation of used machines and the other to the installation of new machines. As in the case of the first method, costs accumulated for the installation of used machines may be totalled and directly expensed during the course of the work. Costs accumulated for the installation of new machines must be distributed between the various new machines when the area, or job, is finished. "Installed cost" of the new machine for capitalization purposes is obtained by adding to the purchase price of the machine, f.o.b. the jobsite, its proportionate share of the total installation costs accumulated under the area-work-order

assigned to new machines, plus the job overhead and contractors' fees percentage.

Numerous modifications and combinations of these two general methods will suggest themselves both to the accountant and the engineer after a preliminary study of the problem. It is to be emphasized that, in the interests of later harmony, both the engineer and the accountant should agree upon, and thoroughly understand, the method to be used.

Individual-Work-Order

The individual-work-order method has a definite disadvantage in that a large amount of field accounting supervision and checking is necessary to insure that installation costs are applied to the proper machine. This frequently involves the charging out of individual small items of installation materials, for instance, a few pipe fittings, or a few feet of electrical wire, a can of "pipe dope", and so forth. Field accounting supervision must be constantly on the alert to insure that materials and/or labour charged to a given machine are actually used on that machine. The cost of this field accounting supervision is frequently excessive in proportion to the overall job cost, particularly if a relatively large number of machines, both used and new, are to be installed.

The individual-work-order procedure, however, when adequately supervised, offers maximum accuracy.

Area-Work-Order

The area-work-order method requires a bare minimum only of field accounting supervision, and imposes the least burden on installation crew foremen in distributing labour hours as they are consumed. In some cases, it is practicable to charge installation materials by stock-room inventory difference. Even when this method of charging installation materials is not practicable, the area-work-order procedure almost completely eliminates the necessity for charging individual small items of materials. Certainly the stock-room clerk is much less prone to error when he is charging materials to only two area-work-orders instead of to a multiplicity of individual-work-orders Under this second procedure, as in the first, it is necessary to differentiate between used machines and new machines in the area.

Thus, the area-work-order procedure offers acceptable accuracy, with a minimum of field accounting supervision.

Under the area-work-order method, the accumulated labour-plus-material costs are given to the engineer after all work in the area has been completed. It then becomes the engineer's responsibility to apportion the accumulated costs between the various machines installed. The engineer should also have at hand the total of the expensed charges (installation costs accumulated for installation of used machines). By comparing these totals during an actual field survey of the completed area, the experienced engineer can make the first decision required,

which is whether the ratio between installation costs of used and new machines is in practical agreement with the physical aspects of the completed area, taking into account the relative difficulty of installation of the various pieces of equipment. If the cost ratio is in agreement with the physical arrangement and proportion between new and used machines, the costs which have been expensed are returned to the accountant intact. If too great a discrepancy is noted between this ratio and the physical aspect of the area, it is indicative of improper differentiation between charges to the used equipment area-work-order and to the new equipment area-work-order. When this occurs, the engineer should combine both area-work-order totals, and make a complete area survey of both new and used machines, apportioning the total charges to all machines. The total thus apportioned to used machines is reported to the accountant, who is then in a position to revise the total previously directly expensed either upward or downward to agree.

The installation cost apportioned to each new machine is reported to the accountant who adds the purchase price of the machine f.o.b. the jobsite, and capitalizes the total as "installed cost" for that individual new machine, plus the percentage for overhead and fees.

If the job has been an extensive one, involving a number of different production departments or areas, the engineer will, of course, make a comparison between the installation costs of similar types of machines in various areas. These costs should be in reasonable agreement. If they are not, the engineer should carry his analysis further to determine why such reasonable agreement does not exist. Frequently, during the process of extending his analysis, the engineer will bring to light previously unsuspected errors in stockroom charges, mistakes in labour distribution, and even overlapping or duplicated charges to adjacent area-work-orders. Having uncovered such unsuspected errors by the extension of his analysis, the engineer proceeds to revise his apportionments accordingly.

The Equivalence Factor

The engineer uses the basic methods of engineering appraisal in all distributions which he makes. He must be familiar with all the trades involved in the installation work, and must know the applicable hourly rates. He should further have a knowledge of the work characteristics of the installing personnel since some teams work faster than others; the work of some teams may be characterized by a large amount of "clean-up" while another team may consistently show only a small amount. In order to apportion the total charges under a given area-work-order between all the machines in that area, the engineer's first step is to set up an "equivalence factor" for each machine. This "equivalence factor" is a number which represents a measure of the difficulty of installing the particular machine. Correctly set up for each machine, the cost of installing any machine may be compared with the cost of installing any

other machine by a simple comparison of their respective "equivalence factors". Distribution of the area-work-order total costs becomes then simply a matter of apportioning the costs in proportion to the values of the "equivalence factors". The key to the final apportionment of accumulated installation costs to the various machines involved is at once seen to be this "equivalence factor".

In setting up this factor, the engineer makes a field survey of the completed area noting the total number of machines in the area and listing trades used in installing each machine. With his knowledge of the trades involved, the applicable hourly rates, the work characteristics of the installing crews, the unit costs of installation materials and the number of connections made to, or the amount of work done on, each machine by each trade, the engineer will make an estimate of the cost of installing that machine. In making this estimate, the engineer neglects the wages of all supervisory installation personnel and also neglects such items as prime- and sub-contractors overhead and fees. Ordinarily, the wages of supervisory installation personnel will have been charged at regular intervals to the area-work-order in question. The items of job overhead and fees will usually be reported to the accountant in the form of a separate billing based upon a percentage figure previously defined in a contract, or previously agreed upon. The accountant will apply this percentage to all costs reported by the engineer. By this means, the "installed cost" will include the proportionate share of job overhead and contractor's fees. The engineer's "equivalence factor" is, thus, based upon the direct cost only of installing the machine. Having made his estimate of installing cost, the engineer will set any arbitrary monetary value as equal to one "equivalence unit". The quotient obtained by dividing this estimate of installation cost by the arbitrary monetary value of one "equivalence unit" will be the "equivalence factor" for that particular machine. This process is carried out for each machine in the area. The "equivalence faetors" thus obtained form the basis for the apportionment of the total accumulated area-work-order costs to the individual machines in the area.

In cases and in areas where a number of similar machines are installed, the engineer may correctly and with acceptable accuracy bypass the operation of actually estimating the cost of installing individual machines in favour of simply evaluating the relative work difficulty of each trade in the area. As in the estimation method, here also the engineer must determine the number of connections made to, or the amount of work done on, each machine by each trade. In this "relative difficulty" method as in the estimation method, the "equivalence factor" emerges as the unit of measure.

"New" and "Used" Equipment Installation Costs

This general problem arose recently in the plant of a large mid-Western pharmaceutical manufacturer. Specifically stated, the total

accumulated costs of "new" equipment installation was billed by the general contractor at $340,659.79. During the course of the installation work, a total of fifty area-work-orders were issued by the owner to the general contractor. Prior to the start of the work instructions were issued to the general contractor by the owner that only charges for installation of "new" equipment were to be accumulated under these fifty area-work-orders. Early in the apportionment work, the engineering analysis proved beyond question that errors of significant proportions had occurred in the differentiation between "new" and "used" equipment. It therefore became necessary to extend the engineering analysis to include installation costs of "used" equipment. It also became evident, during the course of the apportionment work, that certain installation charges in certain areas, both of labour and material, could not be entirely accounted for either as installation of "new" or as installation of "used" equipment. Therefore, a second and still further extension of the analytical method was made in these particular cases to differentiate between installation of "new" equipment, installation of "used" equipment, and three previously set up capital accounts, these three capital accounts being Process Piping, Process Air Conditioning, and Building Electrical.

The final distribution of the accumulated total was as follows:

Capitalize as new equipment installation	$132,304.45
Expense as used equipment installation	138,566.95
Capitalize as new laboratory bench installation	56,440.57
Expense as used sink installation	313.50
Transfer to Pilot Plant construction account	95.76
Capitalize in Process Piping Capital Account	5,933.13
Capitalize in Process Air Conditioning Capital Account	1,419.00
Capitalize in Building Electrical Account	5,586.43
Total distributed	$340,659.79

From the above tabulation it is seen that the total of new equipment installation plus the total of new laboratory bench installation amounts to $188,745.02. This total was distributed over 522 separate machines and laboratory benches by the use of "equivalence factors". In some areas, this distribution was carried out by factors derived through the "estimation method", in others the distribution was affected by factors derived through the "relative difficulty" method.

The above tabulation illustrates also how necessary it is for the engineer to carefully scrutinize the area-work-orders as to differentiation between "new" and "used" equipment. In spite of original instructions that only "new" equipment installation costs were to be accumulated under the fifty work orders, the engineering analysis disclosed beyond a question of a doubt that more than half of the supposedly "new" equipment costs was actually incurred in "used" equipment installation.

Microscoping the Power Bill . . .

By W. Brouillard, C.G.A.,
Supervisor, Cost Department, Canadian Celanese Limited, Drummondville, Quebec.

In many cases, industrial power bills are never analyzed by the consumer, but are accepted without question. In this paper, the author defines the more important terms used in connection with electrical power, and outlines a procedure which can be utilized in analyzing the power bill.

BEFORE proceeding with a discussion of the electric power bill, it may be well to repeat certain terms or definitions which will be helpful in the assimilation of this study. Some of the more important terms are:

Horsepower (hp):

A horsepower is that rate of doing work which would accomplish 33,000 foot-pounds of work per minute, or 550 foot-pounds per second.

James Watt, the inventor of the steam engine, first used the term "horsepower". He found that a draught horse was capable of doing work, for a short time, equivalent to lifting 33,000 lbs. 1 foot high in 1 minute. This value has since been universally adopted.

Kilowatt (kw):

A kilowatt is 1,000 watts and is a rate of doing work based on the centimetre-gram-second system (C. G. S. system).

Kilowatthour (kwh):

This is 1,000 watts (or 1 kw) of energy used for 1 hour. One horsepower is .746 of a kilowatt. 1 horsepowerhour + .746 = 1 kilowatthour. 1,000 watthours = 1.34 horsepowerhour.

Maximum Demand, or Peak Load:

The use of power is not, generally speaking, constant. A manufacturing establishment may normally use 2,000 kw during the day, but this may rise to 2,500 kw at six o'clock when, for example, the night shift begins and, simultaneously, much electricity is needed for lighting purposes. As everyone knows, an electric motor uses relatively more power when starting up. After all the machines in a plant are in operation, the demand may drop to 2,300 kw. The peak load, or maximum demand is, however, 2,500 kw. On another day in the same calendar month, the peak load required may be 3,000 kw. This latter figure would then be the maximum demand for the calendar month, assuming no higher peak loads were registered during the rest of the month. The contract specifies the length of time these peak loads must last to become standard for the calendar month. This time is usually fifteen minutes or more consecutively. If an emergency peak of, say, 4,000 kw is registered for a few minutes only, the user may have to pay

a small penalty of perhaps five cents per kw on such a transient demand, but it would not be necessary to pay the full demand rate on 4,000 kw.

Load Factor:

The following definition of the load factor is found in one of the leading mechanical dictionaries:

> "The load factor of a machine, plant, or system is the ratio of the average power to the maximum power during a certain period of time. The average power is taken over a certain period of time, such as a day, a month, or a year, and the maximum is taken as the average over a short interval of maximum load within that period. In each case, the the interval of maximum load and the period over which the average is taken should be definitely specified, such as a "half-hour monthly" load factor. The proper interval and period are usually dependent upon local conditions and upon the purpose for which the load factor is to be used."

The load factor of the electric power bill, as stated previously, is usually based on a maximum load of fifteen minutes or more. The load factor can then be called a "quarter-hour load factor".

Practically all electric power rates are based upon two main factors: maximum demand and monthly consumption. The link between the two is the load factor. If the demand in a 30-day month (720 hours) is 2,000 kw and is constant for the month, the load factor is 100%. The load factor is the actual kilowatthours consumed during the month divided by the maximum demand carried continuously for the entire month. If the actual consumption with the maximum demand of 2,000 kw were 720,000 kwhs, the load factor would be, of course, 50% (720,000/1,440,000).

When the load factor is 100%, the supplier is selling the full output of his capital investment in equipment reserved for the consumer's use while, in the second example cited above, only half of this reserve potential is used. In this event the cost of power purchased goes up. Therefore, the charge for power is usually split into demand cost and energy cost. The cost of power varies indirectly (but not exactly, as will be demonstrated later) with the load factor. In other words, the higher the load factor the lower will be the purchase price per kilowatthour. This indirect variation is true, as between different bills, only if the number of days involved are the same. On any one bill, the overall price per kwh would, of course, be less if the load factor were higher.

Power Factor

This is a term more difficult to understand. It is, nevertheless, most important. The power contract will, no doubt, specify at what power factor the power is to be supplied. Generally speaking, the purchaser is obligated to install the equipment necessary to make the contracted power factor possible. A common power factor is 85%. In lay language the power factor means the synchronization of voltage, or pressure, and amperage, or electric current.

The determination of the power in a direct current circuit is a simple matter since it is only necessary to multiply together the volts and

amperes to obtain the output in watts. In the case of alternating current (the current usually used) circuits, this holds true only when the current is in phase with the pressure — a condition rarely found in practice. When the current is not in phase with the pressure, the product of volts and amperes as indicated by the volt meter and ammeter must be multiplied by a coefficient called "power factor" in order to obtain the *true watts*, or actual power available. An excellent definition of power factor is "the number of watts indicated by a watt meter, divided by the apparent watts, the latter being the watts as measured by a volt meter and ammeter." In other words, "power factor" means the multiplier used with the apparent watts to determine how much of the power supplied is available.

An analogy which should clarify "power factor" is to consider the following: a dory, or yacht, usually has a propeller shaft at a considerable angle to the water level, so that the full thrust of the propeller wheel is not effective in propelling the yacht. The dory may have a motor developing 5 hp, but the angle of the shaft may be such that only 4 hp is actually effective in moving the yacht. Actually a 5 hp motor with a shaft inclined fifteen degrees would lose .17 hp because of the inclination of the shaft, this not considering the inefficiency of the propellor and, of course, other factors not directly falling under the scope of power factor.

It is theoretically factual that if the shaft of the dory were exactly vertical the power used would be 5 hp, but the dory would remain stationary. If the shaft were exactly horizontal the dory would cover a distance equivalent to the work that could be done with 5 hp; i.e., the efficiency would be 100%, not considering other factors such as resistance of the wind and friction.

The "Power Bill"

Now that the foregoing definitions have been recorded for reference, it is in order to discuss the power bill itself. In this case, "power bill" will mean the normal bill a company receives when power has been used each working day of a normal month.

There are usually only two reasons why the cost of purchased power varies from one month to another. These reasons are:

(a) The number of days or hours involved in the bill (usually bills are calendary).

(b) A change in the peak load, or maximum demand, ratio (total kw, or hp, demand to total kwhs purchased), after adjustment for time.

Eletcric power rates, in the normal bill are, as previously stated, normally two in number, as follows:

(a) A fixed rate of so many cents per kwh purchased.

(b) A fixed rate of so many dollars and cents per unit of maximum

demand (kw or hp), or peak load, registered during the period covered by the bill.

To make this study easily comprehensible, it will be helpful to dissect the two following hypothetical bills:

FEBRUARY

		Rates	Amount
No. of days	28		
Power Factor (%)	85		
Peak Load (kw)	1,885	$1.00	$1,885.00
Kwhs purchased:			
1,885 kw x 50 hours	94,250	1.7c	1,602.25
1,885 kw x 50 hours	94,250	1.5c	1,413.75
Balance kwhs	754,000	.25c	1,885.00
Total kwhs	942,500		$6,786.00

Average cost per kwh: .72c (or $.72 per 100 kwhs).

MARCH

		Rates	Amount
No. of days	31		
Power Factor (%)	85		
Peak Load (kw)	2,250	$1.00	$2,250.00
Kwhs purchased:			
2,250 kw x 50 hours	112,500	1.7c	1,912.50
2,250 kw x 50 hours	112,500	1.5c	1,687.50
Balance kwhs	832,500	.25c	2,081.25
Total kwhs	1,057,500		$7,931.25

Average cost per kwh: .75c (or $.75 per 100 kwhs)

Why do the hypothetical bills show *three* rates based on kwhs purchased when it has been stated that there was only *one* rate per kwh? The answer is, as will be demonstrated, that the rates of 1.7c and 1.5c on the first and second fifty hours of maximum demand are composite rates based on demand and kilowatthours purchased. A normal bill in the sense used here occurs when 100 times the kw demand is equal to or greater than the actual number of kwhs purchased. With the exception of extreme circumstances, which will be explained later, the cost of power itself per kwh will be a fixed rate. In the hypothetical bills used here that rate is ¼c per kwh.

The practical cost accountant or engineer, therefore, resolves the rates into two only, as follows:

Kw demand	$1.00
First 50 hours of kw demand (a)	.725
Second 50 hours of kw demand (b)	.625
Rate per kw of Maximum Demand	$2.35

(a) (1.7c less .25c) x 50
(b) (1.5c less .25c) x 50

To show that the above calculations are correct, the following proof, based on the hypothetical bills, can be used:

1,885 (kw demand) x $2.35	$4,429.75	.47c per kwh
942,500 (total kwhs purchased) x .25c	2,356.25	.25 purchased
Amount of February bill	$6,786.00	.72c
2,250 (kw demand) x $2.35	$5,287.50	.50c
1,057,500 (total kwhs purchased) x .25c	2,643.75	.25
Amount of March bill	$7,931.25	.75c

The cost of purchased power was .72c per kwh in February, or .03c less than in March. Proceeding from the premises stated in (a) and (b) above, the increase of .03c shall be broken down into its two causes.

The increase in the overall cost per kwh, .03c, is to be found in the peak load overall cost component which has increased from .47c in February to .50c in March.

Since February was a 28-day month while March had 31 days, the demand rate of .47c in February has decreased in March to the extent of 3/28 simply, and rightly, because the demand is lesser when the time is longer, the other factor being unchanged; therefore: .47c x 3/28 = .05 1/28c. The March power bill *decreased* .05 1/28c because the time in March was 3/28 longer than in February.

The remaining factor to analyze is the demand itself, after adjustment for time:

	(February)	(March)
Demand (kw)	$\frac{1,885 \times 25}{942,500 \times 28} = 47/26,320$	$\frac{2,250}{1,057,500} = 56/26,320$

From this, it is apparent that the real ratio of kw demand, or peak load, to total kwhs purchased increased from 47/26,320 in February to 56/26,320 in March, an increase of 9/26,320; therefore

$$9/26,320 \times \$2.35 = .08\ 1/28c$$

To summarize and prove the calculations:

Increase due to variation in actual kw/kwh ratio	.08 1/28c
Decrease due to longer month of March	.05 1/28c
Total Increase	.03c

There are other ways of making these rather simple calculations, but the calculations used here seem to have the merit of showing comprehensively the thought of mind to be followed by the analyst.

The relation between the power rates which are based on the two main factors of maximum demand and monthly consumption is the load factor. The load factors of the hypothetical bills are:

February	$\frac{942,500 \text{ kwhs}}{1,885 \text{ kw} \times 28 \text{ days} \times 24 \text{ hours}} = 74.40\%$
March	$\frac{1,057,500 \text{ kwhs}}{2,250 \text{ kw} \times 31 \text{ days} \times 24 \text{ hours}} = 63.17\%$

A high load factor signifies constancy of demand.

The load factor, however, must not be taken as a literal guide to the cost of power from one accounting period to another. The load factor in March, 63.17%, is a decrease of 15.10% (74.40% less 63.17% leaves 11.23%. This 11.23% divided by .7440 gives a quotient of 15.10%). The variation is indirect as compared with February, yet it does not mean that the power cost has increased proportionately in March. The actual increase was .75c/.72c, or 4.17%.

For a given time, the cheapest power is a 100% load factor (at a power factor of 100%).

If the load factor is less than 100%, the cheapest power will be the highest load factor for the longest time at the highest power factor.

For any given time whatsoever, the cheapest power will be the lowest ratio of maximum demand to total consumption at the highest power factor.

Sometimes, however, a bill is "abnormal" in the sense that the kw demand multiplied by 100 (in the hypothetical bills discussed in this article) is greater than the total kwhs purchased. In such cases, the power company would charge the usual rate on demand plus a minimum number of kwhs equal to the kw demand multiplied by 100, or whatever the case may be. For example, examine the following bill:

FEBRUARY

		Rates	Amount
No. of days	28		
Power Factor (%)	85		
Peak Load (kw)	1,885	$1.00	$1,885.00
Kwhs purchased (150,000 used)			
1,885 x 50 hours	94,250	1.7c	1,602.25
1,885 x 50 hours	94,250	1.5c	1,413.75
Balance of kwhs	....		....
	188,500		$4,901.00

Here the purchaser has used only 150,000 kwhs, but he is being charged 188,500. If the normal rates were applied the bill would be:

1,885 kw x	$2.35 =	$4,429.75
150,000 kwhs x	.25c =	375.00
		$4,804.75

This is $96.25 less than $4,901.00 and is, of course, equal to the 38,500 kwhs at .25c per kwh which would be charged even if not used.

The above examples are self-evident, definitely utopic and repetitious to a certain extent, but of course this article is not entirely exhaustive. It can be realized that the foregoing is intended to emphasize the important points only. It should be remembered that the above "precepts" apply to normal bills only.

Student Section . . .

Comments by A. V. HARRIS, C.A., R.I.A.

ADVANCED COST ACCOUNTING — PAPER I — 1953 EXAMINATION

QUESTION V (12 marks)

The Red Line Company produces a pharmaceutical product which is processed in three departments. Raw materials enter the process in Department 1 only. There are lost units in all three departments. The production report for April was as follows:

	Dept. 1	Dept. 2	Dept. 3
Units started in process	20,000		
Units received from preceding department		19,000	15,000
Units lost in process	1,000	1,000	1,000
Units in process April 30th		3,000	2,000
Stage of completion of units in process for Labour and Expense		66⅔%	25%

The cost of production in the various departments for the month of April was:

	Dept. 1	Dept. 2	Dept. 3
Materials	$39,900.00		
Labour and Expenses	28,500.00	$32,980.00	$25,625.00

REQUIRED:

Assuming there were no opening inventories at 1st April, prepare a cost of production statement for the month of April showing departmental unit and cumulative unit costs.

SOLUTION TO QUESTION V:

RED LINE COMPANY

PRODUCTION COST REPORT, APRIL 1953

	Dept. 1		Dept. 2		Dept. 3	
	Total	Per Unit	Total	Per Unit	Total	Per Unit
Inventory, April 1, 1953						
Cost from previous dept.			$ 68,400.00	$3.60	$ 86,100.00	$5.74
Cost introduced in dept. material	$ 39,900.00					
Labour and expense	28,500.00		(A) 32,980.00	1.94	(B) 25,625.00	2.05
Lost Unit cost				.20		.41
TOTAL	$ 68,400.00	$3.60	$101,380.00	$5.74	$111,725.00	$8.20
Transferred to next dept.	68,400.00		86,100.00		98,400.00	
In process inventory, April 30th, 1953	Nil		$ 15,280.00		$ 13,325.00	

PRODUCTION UNIT REPORT, APRIL 1953

	Dept. 1	Dept. 2	Dept. 3
To Be Accounted For:			
Inventory April 1, 1953			
Units started in process	20,000		
Units received from previous department		19,000	15,000
	20,000	19,000	15,000
Units accounted for:			
Lost in department	1,000	1,000	1,000
Transferred to next department	19,000	15,000	12,000
Completed, still in department:			
In process in department		3,000	2,000
	20,000	19,000	15,000

Schedule of equivalent production:

(A) Units completed and transferred	15,000
Units in process, ⅔ complete, 3,000	2,000
	17,000
(B) Units completed and transferred	12,000
Units in process, ¼ complete, 2,000	500
	12,500

ADVANCED COST ACCOUNTING — PAPER II — 1953 EXAMINATION

QUESTION 3 (17 marks)

The following is the trial balance of the X Company, after operating for the twelve months' period ended 31st December, 1949:

	Dr.	Cr.
Accounts Payable		$ 108,000.00
Accounts Receivable	$ 440,000.00	
Buildings	1,104,000.00	
Capital Stock		4,000,000.00
Cash in Bank	72,000.00	
Factory Expense	1,120,000.00	
Inventory—1st January, 1949	628,000.00	
Labour—Direct	1,920,000.00	
Labour—Indirect	852,000.00	
Machinery	1,240,000.00	
Office and Administration Expense	452,000.00	
Office—Payrolls	304,000.00	
Purchases—Raw Materials	4,800,000.00	
Reserve for Depreciation—Buildings		144,000.00
—Machinery		284,000.00
Sales		8,052,000.00
Spools and Other Expendable Equipment	132,000.00	
Surplus—1st January, 1949		476,000.00
	$13,064,000.00	$13,064,000.00

The Company has no true cost system, and estimates its costs by

(a) Adding 15% to estimated direct costs to cover overhead, and then

(b) Adding to the total so estimated a profit equal to 12% of the selling price. An estimate of its unit cost is as follows:

Cost per yard—Raw Materials	.89
Weaving—Piece Work	.38
Winding, Warping, etc.	.03
Foremen and Supervision	.10
	$1.40
Factory and Office overhead 15%	.21
	$1.61
Profit 12% of $1.83	.22
Selling price per yard	$1.83

Inventories are comprised chiefly of raw materials, and are to be considered entirely as raw materials at cost. The inventory at 31st December, 1949, was valued at $1,504,000.00.

Annual Depreciation on cost of buildings at 2% and on cost of machinery at 7½% are still to be provided.

The Company has made a preliminary statement of profit and loss and considers the results are inaccurate. There is a suggestion that the estimated costs have mislead management.

REQUIRED:

Prepare statements to indicate the amount of the loss and such data as supports your findings from your analysis of the relative figures.

SOLUTION TO QUESTION 3:

X COMPANY

STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31st DECEMBER 1949

Sales			$8,052,000.00
Cost of Goods Sold:			
Raw Materials Inventory 1st January, 1949		$ 628,000.00	
Purchases		4,800,000.00	
		$5,428,000.00	
Less: Raw Materials Inventory 31st December, 1949		1,504,000.00	
		$3,924,000.00	
Direct Labour		1,920,000.00	
Manufacturing Expenses:			
Indirect Labour	$ 852,000.00		
Factory Expense	1,120,000.00		
Depreciation—Machinery	93,000.00		
—Buildings	22,080.00	2,087,080.00	
			7,931,080.00
Gross Profit			$ 120,920.00
Operating Expenses:			
Office and Administration Expense		$ 452,000.00	
Office Payroll		304,000.00	756,000.00
Net Loss for Year			$ 635,080.00

$$\frac{\text{Total Sales for the Year}}{\text{Unit Cost — estimated}} = \frac{8{,}052{,}000.00}{1.83} = 4{,}400{,}000 \text{ units}$$

	Estimated Cost (Unit)	Total Estimated Cost	Actual Cost	Under-applied	Over-applied
Raw Materials	.89	3,916,000.00	3,924,000.00	8,000.00	
Direct Labour	.41	1,804,000.00	1,920,000.00	116,000.00	
Foreman and Supervisor	.10	440,000.00	852,000.00	412,000.00	
Overhead	.21	924,000.00	(1,235,080.00		
			(756,000.00	1,067,080.00	
Profit	.22	968,000.00			968,000.00
	1.83	8,052,000.00	8,687,080.00	1,603,080.00	968,000.00
			8,052,000.00	968,000.00	
			635,080.00	635,080.00	

COMMENT:

It would appear that the estimates for material are very accurate. Direct Labour costs are not quite so satisfactory, the variance being approximately 6% of actual costs.

The variation in Foremen and Supervisory Labour, and General Overhead is very substantial, and it is in this part of the costs that there might be a further investigation of the actual costs; if these are accurate, the estimate of costs should be revised.

With the volume indicated by the profit and loss statement for the year 1949, it would appear imperative to recommend that a controlled cost system should be installed to assist in control of expenses. This should be introduced without delay.

It was noticed that students, after preparing the statements, often seemed to be in doubt about what might be done with the figures — and how to compare them with the estimated data. Therefore, comments were usually notable for their absence. Average mark for all papers marked was 10 out of a possible 17.